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Sediment transport by surface erosion in a mountain catchment draining Japanese cypress forest –understanding connectivity of sediment from hillslope to channel–

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Sediment yield and soil erosion in forest floors of unmanaged Japanese cypress (*Chamaecyparis obtusa*) plantation has been noted and is believe to be a serious problem in Japan. Because Hinoki stands were overstocked and canopy coverage remained high, understory vegetation failed to develop. In addition, leaf litter of Hinoki is easily transported by rain splash and overland flow because foliage readily fragments. Therefore, variable amount of mineral soil are typically exposed. Under such conditions, rain splash, soil surface sealing (or crusting), and resultant overland flow may promote soil surface erosion. However, very few studies examined occurrence of soil surface erosion on hillslopes and sediment transport from hillslopes to channel ways.

To understand the connectivity of sediment form hillslopes to channel, a nested monitoring network from hillslope plots to catchments was established in a 0.33 ha catchment of southern Japan. Catchment was covered by 40 yrs-old unmanaged Hinoki forest with sparse understory vegetation. We installed 27 splash cups and 3 runoff plots (0.5 m x 2 m) for assessing overland flow and soil surface erosion on hillslopes. Runoff responses and sediment yields at outlets of sub-catchments were monitored by 5 parshall flumes and two turbidity sensors. Suspended sediment in channels was collected using a time-integrated suspended sediment sampler. Cesium-137 and Lead-

210 excess associated with suspended sediment and soil samples at potential sources within the catchment were analyzed by a gamma-ray spectrometer. Stable isotope of runoff water during storm events was also analyzed for estimating overland flow contribution on catchment storm runoff.

The storm event by the typhoon Navi brought precipitation of 646 mm with the maximum rainfall intensity of 37 mm h^{-1} around the study site from 4 to 7 September, 2005. During this storm event, sediment yield from splash cup and erosion plots were 1034 g m^{-2} and from 11 to 52 g m^{-2}, respectively. Sediment yields observed in the small and large tributaries were 138 g m^{-2} and 801 g m^{-2}, respectively, which were comparable to that on hillslopes. Hydrological separation using stable isotope indicated that significant contribution of overland flow on catchment storm runoff was found only in large catchment, but almost no contribution in small catchment. Suspended sediment concentration (SSC) appeared to correspond to overland flow generation. SSC in the small tributary increased prior to increases in discharge, while in the large tributary, peaks of suspended sediment concentrations were typically bimodal: one was prior to increases in runoff volume; and the other was prior to discharge peak. Multivariate sediment-mixing model using FRNs indicated high contribution from forest floor to suspended sediment in the small tributary, while low in the large tributary. These results suggested that truck trail network can play roles of not only a sediment source but also the pathway of water and sediment from hillslope to channel. Our findings demonstrated that various pathways of connectivity from hillslope sediment sources to channels were developed with respect to rainfall intensity and overland flow generation. Such connectivity produced unique responses of sediment transport in forested catchments.